Exposure Assessment of Contaminants Associated with Reclaimed Water and Biosolids

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Environmental issue being addressed: Population increases within the US, especially within urban and suburbanized areas, are putting increased demands on our natural resources, resulting in the increased use of recycled materials. Of these, increased use of reclaimed water (i.e., treated wastewater) for irrigation of crops and recreational turf in parks and sports fields and the use of biosolids as fertilizers and soil amendments are becoming increasingly common. Over 2% of treated wastewater is used for irrigation and the rest is released to surface and groundwater. It is expected that, by 2010, 48% of biosolids will be land applied. Human health pharmaceuticals have been found in both treated wastewater and in biosolids and have been detected in aquatic environments and fish. Methods to proactively assess potential exposure and risk for these and other contaminants associated with biosolids and reclaimed water are needed.

Scientific approach to resolving the issue: This work was funded under the EPA Science To Achieve Results (STAR) Drinking Water (2000)—(R829006). We hypothesize that the risk assessment paradigm used for pesticides would be valid for pharmaceuticals and other chemicals that may be present in wastewater and biosolids. Laboratory environmental fate measurements for a class of pharmaceutical chemicals were conducted in a manner similar to those tests required for pesticide registration following EPA protocols wherever possible. Tests were conducted to determine chemical distribution and persistence. Additionally, the occurrence of each drug was measured in raw and treated wastewater and receiving water at sub-ppb levels to validate laboratory observations. This approach has allowed exposure and risk assessments for these chemicals to be directly benchmarked with pesticides.

Partnerships in both conducting the work and applying the results: It is anticipated that partnerships with scientists and policy makers in EPA's Office of Water and within the Office of Prevention, Pesticides, and Toxic Substances (OPPTS) will be necessary to directly incorporate the results of this research into EPA policy on pharmaceutical and personal care products as well as other contaminants in recycled materials.

Impact that EPA science has made or expects to make on the issue: The ultimate benefit of this research will be to provide extensive environmental fate, ecotoxicity, and occurrence information on a class of chemicals for which little data are published in the literature, but that have the potential to be present in waterbodies, including drinking water sources that receive treated wastewater effluent. Pesticide regulatory studies are a good benchmark to base aquatic risk assessments. This information should allow environmental risk assessments to be conducted for these compounds and could be a model by which pharmaceutical manufacturers could begin to assess their products as they are commercialized. Ultimately, it will serve as a resource to make informed decisions about the potential human and ecological health concerns of contaminants in recycled materials.

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